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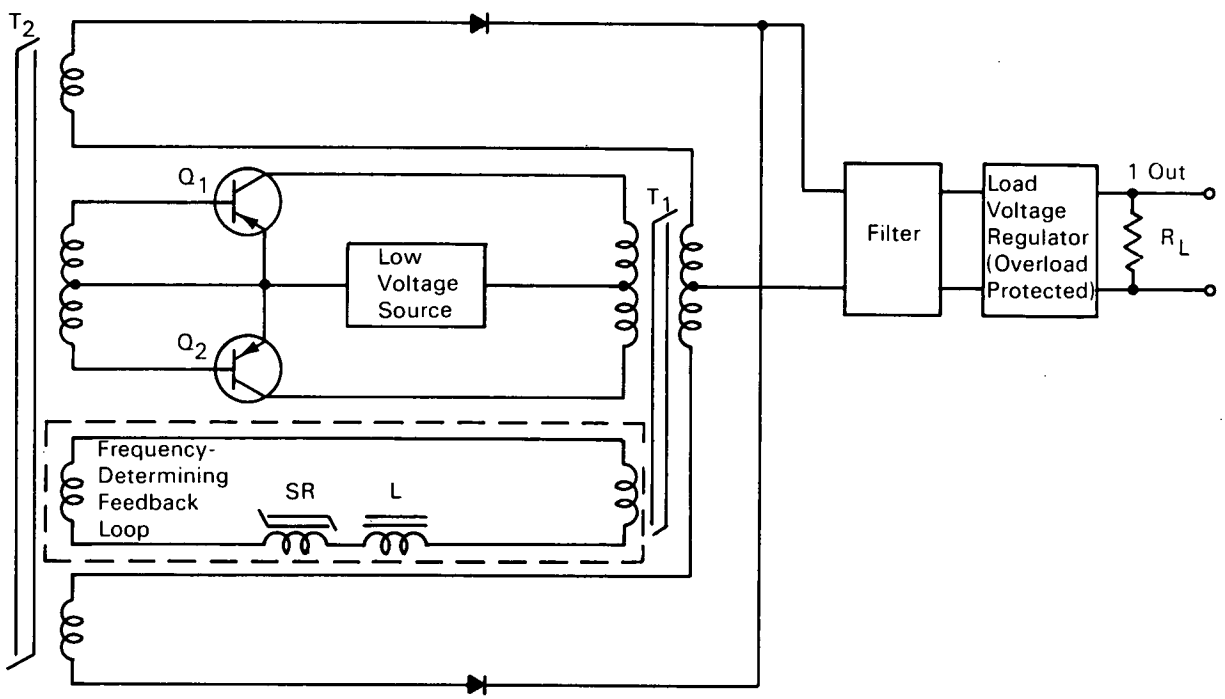
NASA TECH BRIEF

Efficient/Reliable DC-to-DC Inverter Circuit



Certain types of primary electrical power sources have output voltages as low as one or two volts. A conventional practice is to step up the output voltage with a dc-to-dc inverter that employs large-area, high-current transistors.

The long rise, decay, and storage times inherent in this type of transistor produce switching and circuit overlap losses which degrade inverter efficiency and reduce its operational lifetime. This problem has been eliminated by a novel frequency-determining feedback loop added to a standard inverter circuit shown in the schematic. The feedback loop contains an inductor (L) in series with a saturable reactor(SR); the proper value of inductance in this loop permits the inverter power transistors Q_1 and Q_2 to be switched in a controlled and efficient manner.

It is important to note that this inverter design is protected against T_1 core saturation effects as well as storage time overlap.

Advantages afforded by this improved dc-to-dc inverter include: (1) it can be used with a transformer current feedback inverter or with a voltage feedback driven inverter since the switchover is controlled by the frequency-determining loop-function interval only; (2) total circuit switching-time performance approaches the intrinsic transistor com-

(continued overleaf)

ponent rise and fall time; (3) overlap and switching inverter crossover ripple is minimized for a wide range of load demands and input voltages; (4) proper base-drive current-shaping for optimum inverter performance is provided during the entire cycle.

The new crossover technique can be used with both high and low impedance sources. The base current control and shaping, used with push-pull oscillator inverters, improve total inverter crossover performance, and eliminate most of the transient voltage and current spiking conditions normally present at the source output. Output ripple conditions at the load are also reduced without the need of additional filters. Thus minimal input/output ripple can be obtained without incurring a size and weight penalty.

Notes:

1. This inverter can be used in dc-to-dc converter circuit applications where the power source may have either high or low impedance properties.
2. The following documentation may be obtained from:

   Clearinghouse for Federal Scientific
   and Technical Information
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.65)

   Reference:
   NASA-TM-X-63118 (N68-18065), Low Input Voltage Conversion-Regulation From Non-conventional Primary and Secondary Sources

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,466,570), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to NASA, Code GP, Washington, D.C. 20546.

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